 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

SECOND SEMESTER – APRIL 2011

# ST 2811 / 2808 - ESTIMATION THEORY

Date : 2/4/2011 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

**SECTION – A**

**Answer all the questions (2x10=20)**

1. Define Minimal Sufficient Statistic
2. Define Efficient Estimator
3. Define Ancillary Statistic
4. State the different approaches to identify UMVUE
5. Define Likelihood Equivalence
6. Define D–optimality
7. Define Location-Scale Family
8. Define Minimum Risk Equivariant Estimator(MREE)
9. Define CAN estimator
10. Define Maximum Likelihood Estimator

**SECTION – B**

**Answer any five questions (5x8 = 40)**

1. Obtain UMVUE of θ(1- θ) using a random sample of size n drawn from a Bernoullie population with parameter θ
2. State and Establish Rao-Blackwell theorem
3. State and Establish Neyman-Fisher Factorization theorem
4. i) Let L be squared error then MREE of θ is unique (4)

ii) Let X1,X2,...,Xn be a random sample from N(θ,1), Show that  (4)

1. Let δ be a LEE and L be invariant then show that i)The Bias of δ is free from θ

and ii) Risk of δ is free from θ (4+4)

1. i) State and Establish Basu’s theorem (6+2)

ii) Define UMRUE

1. Determine MREE of θ in the following cases i) N(θ,1) , θ ∈ R ii)E(θ,1) , θ ∈R
2. Let X1,X2,...,Xn be a random sample from population having pdf



obtain MLE of P(X>2)

**SECTION – C**

**Answer any two questions (2x20 = 40)**

1. i) Establish: If UMVUE exists for a parametric function Ψ(θ), It has to be essentially unique (10)

ii) State and Establish Cramer-Rao Inequality for multi-parameter case and hence deduce the inequality for single parameter (10)

1. Establish: δ\*∈ Ug is D-optimal if and only if each component of δ\* is UMVUE
2. i) Let X1,X2,...,Xn be a random sample from N(µ,σ2). Obtain Cramer-Rao lower bound for estimating (16)

i) µ ii) σ2 iii) µ+σiv) σ/ µ

ii) Establish: Let T be a sufficient statistic such that T(x) = T(y) then  (4)

1. i) Establish: Let δ\* belong to the class of LEEs. Then δ\* is a MREE with respect to squared error if and

only if E(δ\*u)=0 (10)

ii) Let X1,X2,...,Xn be a random sample drawn from a normal population with mean θ and variance σ2

Find the MLE of θ and σ2when both θ and σ2are unknown (10)

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